FY 2004
Comprehensive Energy Management Plan

Lawrence Livermore National Laboratory
Mechanical Utilities Division
Energy Management Program

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University of California
Lawrence Livermore National Laboratory

LLNL FY 2004 Comprehensive Energy Management Plan

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Exhibits

LLNL FY 2004 Comprehensive Energy Management Plan

This document is organized following the format of the Contractor Requirements Document (CDR), Attachment 1, of DOE O 430.2A, Departmental Energy and Utilities Management. Short and long-range energy management program goals are addressed, as are specific performance criteria consistent with the CDR. The Priority Action Plan includes specific performance objectives for FY 2004 & FY 2005.

1. Short and Long-Range Energy Management Program Goals

A. Short-Range (Year 2005) Goals

1. Reduce energy consumption per gross square foot (or other unit as applicable) for laboratory and industrial facilities through life cycle cost-effective measures by 20% by 2005 using a 1990 baseline.
2. Increase the purchase of electricity from non-hydroelectric renewable energy sources by including provisions for such purchases as a component in all future DOE competitive solicitations for electricity.

   Not applicable at Lawrence Livermore National Laboratory (LLNL). Electric power purchases for LLNL, and other San Francisco (SF) Bay Area DOE facilities are arranged through the DOE Service Center. Discussions addressing policy, efforts to encourage the purchase of electricity generated from renewable energy sources are deferred to the DOE Service Center.

3. Increase the purchase of electricity from less greenhouse gas-intensive sources, including, but not limited to, new advanced-technology fossil energy systems and other highly efficient generating technologies.

   Not applicable at Lawrence Livermore National Laboratory (LLNL). Electric power purchases for LLNL, and other San Francisco (SF) Bay Area DOE facilities are arranged through the DOE Service Center. Discussions addressing policy, efforts to encourage the purchase of electricity generated from renewable energy sources are deferred to the DOE Service Center.

4. Retrofit or replace all chillers greater than 150 tons of cooling capacity and manufactured before 1984 that use class I refrigerant by 2005.
5. Reduce greenhouse gas emissions attributed to facility energy use through life cycle cost-effective measures by 25% by 2005 using 1990 as a baseline. Greenhouse gas emissions are carbon dioxide emissions calculated from reported energy consumption.

B. Long-Range (Year 2010) Goals

1. Reduce energy consumption per gross square foot (or other unit as applicable) for laboratory and industrial facilities through life cycle cost-effective measures by 25% by 2010 using a 1990 baseline.
2. Increase the purchase of electricity from non-hydroelectric renewable energy sources by including provisions for such purchases as a component in all future DOE competitive solicitations for electricity.

   Not applicable at Lawrence Livermore National Laboratory (LLNL). Electric power purchases for LLNL, and other San Francisco (SF) Bay Area DOE facilities

are arranged through the DOE Service Center. Discussions addressing policy, efforts to encourage the purchase of electricity generated from renewable energy sources are deferred to the DOE Service Center.

3. Increase the purchase of electricity from less greenhouse gas-intensive sources, including, but not limited to, new advanced-technology fossil energy systems and other highly efficient generating technologies.

   Not applicable at Lawrence Livermore National Laboratory (LLNL). Electric power purchases for LLNL, and other San Francisco (SF) Bay Area DOE facilities are arranged through the DOE Service Center. Discussions addressing policy, efforts to encourage the purchase of electricity generated from renewable energy sources are deferred to the DOE Service Center.

4. Assure that all chillers greater than 150 tons of cooling capacity and manufactured before 1984 that use class I refrigerant and scheduled to be retrofitted or replaced after 2005 are kept on-schedule. Note: Retrofitting and/or replacements of selected chillers meeting these criteria were deferred to after 2005 ONLY if they are not in current use.

5. Reduce greenhouse gas emissions attributed to facility energy use through life cycle cost-effective measures by 30% by 2010, using 1990 as a baseline. Greenhouse gas emissions are carbon dioxide emissions calculated from reported energy consumption.

2. Emergency Energy Conservation Plans

A. Emergency Energy Conservation – Electric Power

The Electric Utilities Division of the LLNL Laboratory Services Directorate, UTel Department, developed an Emergency Electrical Power Load Reduction Plan in response to the California Energy Crisis of 2000 – 2001. A copy of the current plan is provided as Exhibit A: Electrical Power Curtailment Program (UTel / EUD).

This plan will be reviewed and updated periodically as changes are made to the electric distribution system and facility capabilities to automatically reduce loads. An annual review will be executed to determine if conditions warrant modifications.

B. Emergency Energy Conservation – Natural Gas

The Mechanical Utilities Division of the LLNL Laboratory Services Directorate, UTel Department, developed a Draft Emergency Natural Gas Curtailment Plan. A copy of the draft plan is provided as Exhibit B: DRAFT Emergency Natural Gas Curtailment Plan (UTel / MUD)

This plan will be reviewed and updated periodically as changes are made to natural gas consuming and distribution systems and facility capabilities to automatically reduce loads. An annual review will be executed to determine if conditions warrant modifications.

C. Emergency Energy Conservation – Fuel Oil

Fuel oil is used at only a few Site 300 facilities for space heating systems. Fuel oil is used only for emergency generators at the Main LLNL Site. Adequate supplies of fuel oil are maintained on-site for emergency generator and limited space heating needs. Thus, it is determined that an emergency load reduction plan is not needed for fuel oil at LLNL.

3. FY 2004 & FY 2005 Priority Action Plan

A two-year Priority Action Plan is provided as Exhibit C: LLNL Priority Action Plan FY 2004 & FY 2005. The plan includes actions identified in support of this Energy Management Plan and Leadership Goals expressed in DOE O 430.2A, Contractor Requirements Document (Attachment 1) and will be updated on an annual basis.

4. Annual, Continuous Life-Cycle Cost-Effective Improvements

A. Greenhouse Gas Emissions Reductions

Continuous life-cycle cost-effective reductions of Greenhouse gas emissions attributed to facility energy use is required. The long-term goal is a reduction of 30% by 2010 as compared to emissions levels in 1990.

LLNL – Energy Management Program (LLNL – EMP) will promote the selection of modulating condensing boiler systems for new construction, retrofit and renovation projects wherever life-cycle cost-effective. Assistance will be provided to project management teams via the LLNL Plant Engineering Department design review process.

Progress towards this requirement is based on data contained within the DOE – FEMP EMS-4 web based energy use and cost reporting system. Progress towards reducing greenhouse gas emissions is illustrated in Exhibit D: LLNL – Historic Greenhouse Gas Emissions from Facility Energy Use.

B. Reduce Energy Consumption per Gross Square Foot – Buildings Category

Continuous life cycle cost-effective improvement is required on an annual basis toward reducing energy consumption per gross square foot by 30 percent by 2005 and 35 percent by 2010 relative to 1985 for those facilities included within the Buildings energy reporting category. The requirement is **not applicable to LLNL**, which has been placed into the Industrial & Laboratories Facilities Category

C. Reduce Energy Consumption per Gross Square Foot – Industrial & Laboratory Facilities Category

Continuous life cycle cost-effective improvement is required on an annual basis toward reducing energy consumption per gross square foot by 20 percent by 2005 and 25 percent by 2010 relative to 1990 for those facilities included within the Industrial and Laboratory Facilities energy reporting category. Progress towards reducing energy use per floor square footage is shown on Exhibit E: LLNL – Historic Facilities Energy Use.

Note that the 2005 goal has already been achieved and the 2010 goal was achieved at the end of FY 2002. Increased energy use during FY 2003 is attributed to significant new facilities construction power use, partial operation of facilities under construction and not

yet "beneficially occupied" (energy use is recorded, but floor area has not yet been added to FIMS database) and to several increases in programmatic power use.

Planned activities to achieve the Long-Range 2010 goal, and to retain achievement of the Short-Range 2005 goal, include the following:

1. Evaluate effects of Beneficial Occupancy of facilities currently under construction; achievement of the goal may be reestablished by simply waiting for projects to be completed
2. Review extraordinary programmatic power consumption (particularly NIF) to determine if it would be appropriate to request exemptions for the programmatic/ experimental power consumption. Apply for relevant exemptions.

D. Reduce Water consumption through water efficiency programs and plans.

Continuous annual life cycle cost-effective improvements are required toward reducing water consumption through water efficiency programs and plans to contribute to the Department's objective of accomplishing 80% of identified life cycle cost-effective water conservation actions by 2010 using the best management practices published by DOE – FEMP as guide.

Annual water consumption for the period between 1990 and 2003 is shown on Exhibit F: LLNL – Historic Water Consumption.

No "life cycle cost-effective water conservation actions" have been identified during previously conducted energy audits of LLNL facilities. An energy & water audit project is currently (January 2004) being commenced which includes identification and economic evaluations of potential water conserving projects using the DOE – FEMP WaterGY tool.

A number of water conserving activities are already practiced at LLNL due to droughts of the early 1990's. In particular, irrigation schedules have been modified throughout the Lab. New building projects are specifying drought resistant plantings that require very little irrigation once growth has been established. All new construction requires compliance with California Title-24 requirements which specify water saving plumbing fixtures. Additionally, a Waterless Urinal Pilot Program, implemented with funding assistance from DOE – FEMP during FY 2003 is already "bearing fruit"; Laboratory Services Directorate offices are being retrofitted with waterless urinals. Also, it appears that waterless urinals will be specified for new buildings planned at LLNL.

Activities planned to reduce future water consumption include:

1. Continue identifying and promoting implementation of water-conserving opportunities in design reviews of new building projects and major renovations.
2. Review recommendations and project evaluations that will result from the energy/water audits currently underway. Select life-cycle cost-effective measures and prepare institutional and DOE – FEMP funding requests for implementation.

5. Energy and Water Audits of Existing Facilities

DOE O 430.2A requires annual progress of at least 10 percent toward completing energy and water audits of all facilities, either through energy savings performance contracts (ESPCs) or utilities energy efficiency service contracts (UESCs) or other means. Include the Energy Star® Building-label rating tool in facility audits of office buildings to support applications for the Energy Star® Building label.

As is illustrated in Exhibit G, before FY 2004, LLNL has completed audits of over 3.2-million SF of building floor area, representing 50.2% of total baseline building floor area to be audited. (Baseline floor area to be audited is calculated by reducing the total "FIMS" floor area by removing buildings to be demolished, tents, bunker/vault buildings, no / low energy using facilities and leased facilities.

During FY 2004, LLNL will complete energy efficiency and water conservation audits contracted during FY 2003. These audits are supported jointly by funds awarded from the DOE – FEMP Model Program and by the LLNL – EMP. These audits represent about 14.1% of the baseline floor area and total over 917,000-SF.

A. **Short-Range (Year 2005) Goal**: By the beginning of FY 2005, LLNL will have completed audits of about 64% of baseline floor areas. Additional audits will be performed during FY 2005 to the extent that funding is available.

B. **Long-Range (Year 2010) Goal**: Following FY 2005, LLNL plans to complete auditing of the remaining baseline floor areas. It is anticipated that the audits will be conducted, as funding is available.

C. **Audit Funding Availability**: DOE O 430.2A suggests that energy and water auditing be performed either through ESPCs or UESCs or other means. It is noted that, with LLNL's very low power rates, that it is difficult to attract interest from energy savings performance contractors; there is little room for them to profit. Notwithstanding, the LLNL – EMP is currently considering requesting "initial proposals" to address potential projects within tow central mechanical utility plants.

6. Implementation of Life-Cycle Cost-Effective Measures by Jan 2005

DOE O 430.2A requires annual progress toward installing all life cycle cost-effective energy and water conservation measures identified by facility audits by 1 January 2005 in DOE-owned buildings.

Audit identified energy efficiency projects are summarized on Exhibit H. Note that several projects are being accomplished "automatically", as parts of various repair/remodel and backlog reduction projects and do not require special funding requests or procedures.

Although the total project backlog totals over $3-million, the project backlog is only about $142,000 for projects with 4-year or less payback periods, the minimum payback period considered cost-effective.

Additional audit-identified energy and water conservation projects will be developed as a result of audits to be performed during FY 2004. An implementation plan will be developed when the audit project is completed. It is unlikely these projects could be implemented by

the January of 2005, thus, their implementation is considered a Long-Range (Year 2010) goal.

A. **Short-Range (Year 2005) Goal**: Develop and submit funding requests to implement backlog projects with payback periods less than 4-years.

B. **Long-Range (Year 2010) Goal**: Execute implementation plan for audit identified, life-cycle cost effective, projects to be identified during FY 2003 / FY 2004 energy and water conservation audits.

7. Energy Star® Building Labels

DOE O 430.2A requires annual progress toward qualifying office buildings for the Energy Star® Building label by December 31, 2002.

The deadline for this goal has passed. During FY 1999, all LLNL buildings were reviewed for their applicability to the Energy Star® Building Labeling program as entire buildings only. Very few buildings were found to meet the Eligibility Requirements for Benchmarking. Most buildings at LLNL are mixed-use buildings with significant space devoted to computer rooms, laboratories and shops. As a research institution, this type of mixed building use is expected, however, it does not lend itself well to the Energy Star® Building Labeling program. The only building found to qualify was a modular building-trailer and was deemed not suitable as an example of an Energy Star® Building. No new office buildings were placed into service during FY 2001. Thus, the findings of the FY 1999 study still stand.

8. Application of Sustainable Design Principles

DOE O 430.2A requires application of sustainable design principles to new buildings and building alterations. Compliance with 10 CFR 434, Energy Conservation Voluntary Performance Standards for New Buildings; Mandatory for Federal buildings, from conceptual design through commissioning.

During the late 1990s, supported by the DOE-OAK EM program, LLNL modified Master Construction Specifications to incorporate specific sustainable building materials selections. Coupled with specific changes for energy efficiency and water conservation, suggested by the Energy Management Program, LLNL's Master Construction Specifications changes have progressed toward institutionalizing sustainable design, energy efficiency and water conservation practices.

Recently, the request for A/E Design-Build services for B242, a new "Generic Office Building", incorporated a specification section detailing requirements for the Energy Efficiency / Sustainable Design Report (EE/SD-R). Additionally, the LLNL Plant Engineering Project Management Division is considering requiring the next Generic Office Building to achieve LEED™ certification.

A. **Short-Range (Year 2005) Goal**: Continue responding to project design reviews to assure that EE/SD-R's are prepared in accordance with DOE O 430.2A, Attachment 3 and the LLNL EE/SD-R specification, as applicable. Continue to recommend and promote LEED™ certification for new buildings.

B. **Long-Range (Year 2010) Goal**: Work towards requiring all new LLNL buildings be LEED™ certified.

9. Showcase Facilities to Highlight Energy & Water Efficiency and Renewable Energy

DOE O 430.2A requires designation of newly constructed facilities with significant public access and exposure as Showcase facilities to highlight energy efficiency and water efficiency and renewable energy improvements.

LLNL buildings and facilities do not have "significant public access and exposure" due to national security concerns involving the nature of the work conducted. Thus, this requirement is not considered applicable to LLNL.

Nevertheless, energy efficiency, water conservation and sustainable design principals are being vigorously promoted for all new buildings and major renovations. (See paragraph 8, above.)

10. DOE/EPA Energy Star® Products

DOE O 430.2A requires selection of DOE/EPA Energy Star® products, including microcomputers and peripheral equipment, into guide specifications and acquisition systems. Where Energy Star® products are not available, selection of products that are in the upper 25% of energy efficiency.

The LLNL Energy Management and the Environmental Protection Programs each communicate with Technical Release Representatives (TRR's) promoting purchases of Energy Star® and other energy efficient products. Additionally, the Energy Management Program provided suggested changes to master construction specifications during FY 2000 related to this requirement.

A. **Short-Range (Year 2005) Goal**: Continue responding to project design reviews to assure that Energy Star® and other energy efficient products are specified.

B. **Long-Range (Year 2010) Goal**: Assure that procurement specifications require the most efficient products identified as Energy Star® and/or meeting current California Title-24 Device Efficiency Standards.

11. Energy Efficiency and Water Conservation as Selection Criteria when Acquiring Leased Buildings

DOE O 430.2A requires use of energy efficiency and water conservation as selection criteria when acquiring leased buildings or when renegotiating or extending existing leases. Alternately, the selection of buildings that have the Energy Star® Building label when leased space in such buildings is available.

This requirement is not currently applicable to LLNL. No new leases were secured in the last several fiscal years, and none are currently planned.

12. Continuous Identification of Energy Conservation Operational and Maintenance Deficiencies

DOE O 430.2A requires, through a system of surveys and inspections, continuous identification of energy conservation operational and maintenance deficiencies as compared to Federal regulations for energy conservation, and the correction of those that are low cost.

During FY 1999, language was added to Preventive Maintenance task sheets to request maintenance workers to identify energy waste by equipment components being maintained. These deficiencies are then added to the building maintenance backlog.

A. **Short-Range (Year 2005) Goal**: Continue the current system of reporting relevant defficiencies via the preventive maintenance program.

B. **Long-Range (Year 2010) Goal**: Continue the current system of reporting relevant defficiencies via the preventive maintenance program.

13. Minimization of the Use of Petroleum-Based Fuels

DOE O 430.2A requires, minimization of the use of petroleum-based fuels in DOE-owned buildings and facilities by switching to a less greenhouse gas intensive, non-petroleum-based energy source such as natural gas or renewable energy source as measured at the end source when life cycle cost-effective. For buildings and facilities that use petroleum-based fuel systems, provide dual-fuel capability where cost-effective and practicable.

Petroleum based fuel use has been minimized at all LLNL facilities. No Main Site buildings use petroleum based fuels and very few buildings at Site 300 have reportable fuel oil uses. Baseline year (FY 1990) consumption of petroleum based fuels was reported at 63.2 K Gallons, whereas, the FY 2003 use was only 12.4 K Gallons, an 80.4% reduction. To date, it has not proven cost effective to replace heating equipment at Site 300 with dual fuel equipment. Natural gas service is not available at Site 300, thus, propane would be the only alternative fuel available. Solar heating is not cost effective.

14. Alternative Funding Mechanisms

DOE O 430.2A requires increased use of alternative funding mechanisms in lieu of direct appropriations for energy efficiency improvements consistent with good business practices.

No Energy-Savings Performance Contract (ESPC) or Utility Energy Services Contract (UESC) projects have been implemented, to date, at LLNL. The LLNL Energy Management Program is working with the LLNL Finance Office to develop policy recommendations for potential future contractual details regarding direct programmatic participation in these programs. At the current time, LLNL energy pricing may be considered too low to attract private investment in shared energy cost savings arrangements.

A recent development involves considering inviting one or two Super ESPC contractors to prepare initial proposals addressing central utility plant energy efficiency and water conservation measures and renewable power generation projects.

A. **Short-Range (Year 2005) Goal**: Seek LLNL management approval to request initial proposals for ESPC projects at LLNL Main Site Central Utility Plants and to consider development of renewable power generation projects related to the LLNL water supply.

B. **Long-Range (Year 2010) Goal**: Seek LLNL management approval to select and implement ESPC projects that may be proposed that are consistent with good business practices.

15. Availability of Trained Energy Managers

DOE O 430.2A requires ensured availability of trained energy managers as needed to effectively implement requirements.

The LLNL Energy Management Program is staffed with engineers trained in energy management. All engineers assigned to the program full-time are required to be Certified Energy Managers. Central to the EMP is the goal to satisfy applicable federal and departmental regulations and orders. It is LLNL's intent to continue this practice during both the short and Long-Range.

16. Increased Use of Off-Grid Electric Generating Systems

DOE O 430.2A requires increased use of off-grid generation systems, including solar hot water and solar electric supporting the Million Solar Roofs initiative, solar outdoor lighting, small wind turbines, fuel cells and other technologies, when such systems are life-cycle cost effective and offer other benefits.

A. Self-Generated Renewable Energy: Only a couple self-generating renewable energy projects have been implemented at LLNL.

The LLNL Environmental Remediation Department has deployed a number of Solar Treatment Units (STU's) throughout the main site and Site-300. The STU's are photovoltaic-powered, portable, groundwater contamination treatment units. Additionally, during FY 2003, the Energy Management Program completed the Visitor's Center Photovoltaic (PV) Exhibit, with capacity of 3.5 kW. This project demonstrates and promotes the application of PV power generation and reduces the electric costs at the LLNL – Visitor's Center.

Widespread application of PV power at LLNL's main site and Site 300 is not presently cost effective due to the low power rates available from the Western Area Power Administration (WAPA) power supply contract. This contract also disqualifies LLNL from consideration for California Energy Commission rebates for renewable energy projects.

LLNL does have several smaller power supply contracts, direct with PG&E, including the Visitor's Center and the MOCHO Pump Station. The Visitor's Center PV Exhibit described above has been installed on one over these accounts.

The MOCHO Pump Station and the water supply infrastructure offer two potential new renewable power generation projects. Model Program funding has been requested from DOE – FEMP to develop and evaluate PV power generation at the MOCHO Pump

Station and hydroelectric power generation from fresh water entering the Sandia Water Tanks. These two projects may also be included in initial proposals from Super-ESPC contractors. An LLNL management decision to invite Super-ESPC contractors to submit initial proposals is pending. (Refer to paragraph 14, above.)

B. **Purchased Renewable Energy**: Not Applicable. Electric power purchases for LLNL, and other San Francisco (SF) Bay Area DOE facilities are arranged direct by DOE.

It is noted, however, that under the current electrical supply contract between WAPA and PacifiCorp, 10% of the 32 MW of electric demand provided to SF Bay Area DOE facilities is supplied from "renewable" sources. (The remainder of SF Bay Area DOE facilities' electrical load is served by WAPA from other sources.)

C. **Million Solar Roofs (MSR)**: No qualifying solar roofs have been installed at LLNL. Part of the challenge in implementing this technology at LLNL involves the low cost of electric power and natural gas. This makes it difficult to identify cost effective applications.

D. **Short-Rang (Year 2005) Goal**: Pursue achieving LLNL Management approval to request Super-ESPC contractors to submit initial proposals to implement identified renewable power generation projects

E. **Long-Range (Year 2010) Goal**: Implement Super-ESPC project(s) to be proposed, if found life-cycle cost effective and or offer other compelling benefits.

17. Control of Energy Consumption Loading to Minimize Cost & Mitigate Impact of Sudden Disruptions

DOE O 430.2A requires control of electric, gas, and water loads to minimize utilities costs and mitigate the impact of sudden disruptions in the energy supply. Adopt a charge program internal to the site for specific customers when needed to curb unnecessary energy consumption or provide accurate usage information.

A. **Electric Power Load Control and Curtailment**: LLNL's present electrical power is provided without time-of-day demand charges and at very low rates (~$2.50/kW-Month), thus, there is not much of an economic incentive to provide load curtailment during normal operations. LLNL is provided electric service by WAPA with a 100% backup supply available continuously from PG&E. An Emergency Load curtailment plan has been developed by and is maintained by the LLNL UTel Electrical Utilities Division. This plan is addressed in paragraph 2, above, and a copy is provided as Exhibit A.

B. **Natural Gas Load Control and Curtailment**: LLNL receives natural gas from the DFSC and contracts with PG&E for pipeline transportation to the Lab. The LLNL UTel Mechanical Utilities Division has developed a DRAFT Natural Gas Curtailment Plan to protect vital facilities and research activities in the event of a sudden disruption in natural gas supply. This draft plan is addressed in paragraph 2, above, and a copy is provided as Exhibit B.

C. **Water Supply Curtailment Plan**: LLNL is provided normal potable water supplies via the Hetch-Hetchy Pipeline and MOCHO Pump Station. A 100% capacity backup

supply is available from the local, Zone 7 Water District. A curtailment plan has not been developed.

D. **Energy Recharge Program**: LLNL programs are "recharged" for their electric power consumption, including a surcharge to support operation and maintenance of the electric distribution system. No recharge programs have been developed for other utilities

E. **Short-Range (Year 2005) Goal**: Continue operation of the successful electric recharge program.

F. **Long-Range (Year 2010) Goal**: Continue operation of the successful electric recharge program. Consider expanding the recharge program to address other utility services to promote curbing of unnecessary energy consumption and to provide accurate usage information.

18. Outreach Program

DOE O 430.2A requires outreach programs as needed to motivate employees to modify behavior to become more efficient in their use of energy and water and to minimize waste.

The LLNL – EMP is involved in a number of on-site energy awareness outreach activities including placement of periodic articles in LLNL electronic and print news publications, promoting energy efficiency and water conservation in the workplace and at home.

The LLNL – EMP also promotes Energy Awareness Month and assists in planning and execution of the annual LLNL-Earth-Day celebration.

Collaborating with LLNL – Public Affairs, the LLNL – EMP participates in elementary school class visits to the Discovery Center, providing a brief presentation promoting energy efficiency ands water conservation. These visits include LLNL-Energy Bike rides by several students from each class. They learn that generating electric power is hard work and are, thus, encouraged not to waste power.

A. **Short-Range (Year 2005) Goal**: Continue current outreach activities.

B. **Long-Range (Year 2010) Goal**: Continue current outreach activities. Add a procedure to promote programmatic electric power conservation, per building and program, depending on the availability of funding to expand the existing MV-90 electric metering program to add this reporting feature.

Electrical Power Curtailment Program

Lawrence Livermore National Laboratory – Site 2

Western Area Power Administration (Western) and Pacific Gas & Electric Company (PG&E) supply power to Lawrence Livermore National Laboratory (LLNL) Site 2. These two Utilities operate their 115 kV systems in parallel at U-424. Both Utility companies fall under the operating jurisdiction of the California Independent System Operator (CAISO) for all generation and transmission load flow. The CAISO is responsible for the forecasting of electrical load for the state of California. If the CAISO forecasts that the system load versus capacity margin is too low, then the CAISO will declare an electrical emergency and request all customers to curtail their use of electricity. These emergencies are classified as Stage 1, Stage 2, and Stage 3. All three electrical emergency stages request LLNL Site 2 to **voluntarily** curtail the use of electricity.

LLNL Site 2 supplies power to Sandia National Laboratory, Livermore (SNL,L). The operating personnel from SNL,L have developed their own criteria for load curtailment which exceed those mandated in the LLNL plans.

LLNL Site 300 has developed a separate plan from this one. Their curtailment criteria are different than the Site 2 plan.

Several small electrical loads are served directly from the PG&E distribution system and are subject to the rotating outage blocks as determined by PG&E.

Some of these are:

Mocho Pumping Station-Block 50
Visitor Center-Block 50
Sunshine Building-Block 50
TFS-A (B-011/042)-Block 50
NIF Warehouse (Patterson Pass)-Block 50
Graham Court-Block 50
Air Sampler (Patterson Pass)-Block 50
Air Sampler (Altamont Pass)-Block 50
S-300 Pistol Range-Block 50
S-300 Tomas Shaft Block 50
Arroyo Pipe Line-Block 50

Exhibit A

Electrical Power Curtailment Program

Lawrence Livermore National Laboratory – Site 2

Voluntary Load Reduction Program:

The Western Power dispatcher is the single point of contact for initiating this program. The Western dispatcher will notify the appropriate LLNL Site 2 Site Utilities Division (SUD) personnel. Plant Engineering/Maintenance/Operations/Site Utilities Division (PE/MO/SUD) will in turn notify the Public Relations Department who in turn will send an E-Mail message sitewide.

Each Facility and employee have the responsibility to voluntarily reduce the use of electricity during a Stage 1, 2, or 3 emergency. All Facility Points of Contact (FPOC's) should have a plan developed and ready for implementation when the announcements are broadcast.

The CAISO has determined that a Stage 1 will be declared when the load versus capacity margin is less than 7%, a Stage 2 when the margin is less than 5%, and a Stage 3 when the margin is less than 1.5%.

The E-Mail messages are as shown below:

"STAGE 1"

A "Stage 1 Electrical Emergency" has been declared. Please turn off any non-essential lighting and appliances. There is no need to turn off essential equipment.

"STAGE 2"

A "Stage 2 Electrical Emergency" has been declared. All customers are asked to further reduce usage of electricity until 8:00 p.m. Please turn off any non-essential lighting and appliances. There is no need to turn off essential equipment.

"STAGE 3"

California is experiencing extreme shortages of electricity today. The electrical transmission system operators have declared a "Stage 3 Electrical Emergency". Utilities in our area have begun rotating blackouts. We do NOT expect a blackout at LLNL, but we must voluntarily reduce our electricity usage further. The emergency will end at 8:00 p.m. tonight unless you are otherwise advised.

Some examples of non-essential lighting and appliances include warehouse/storage room lights, radios, computers not in use, fans, room/window air conditioners, coffee pots, portable electric heaters etc. Each FPOC should evaluate their facility to determine if some "programmatic" equipment that is not actively being used could be shut down during the declared electrical emergency. Every little bit helps.

Exhibit A

LLNL FY 2004 Energy Management Plan

DRAFT Emergency Natural Gas Curtailment Plan

To be provided

Exhibit B

LLNL - Energy Management Program Priority Action Plan FY 2004 & FY 2005

Description of Action	FY 2004				FY 2005			
	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
1. Review & Update as-needed: Emergency **Electrical Power** Load Reduction Plan	-------- X --------				-------- X --------			
2. Review & Update as-needed: Emergency **Natural Gas** Curtailment Plan			-------- X --------				-------- X --------	
3. EM Plan **&** 2-Year Priority Action Plan - Update & Submit to DOE-FEMP	X				X			
4. Annual In-House Energy Management Report - Prepare & Submit to DOE-FEMP	X				X			
5. Report Energy Uses and Costs via DOE-FEMP web based EMS-4	X	X	X	X	X	X	X	X
6. Evaluate construction power use for facilities under construction		X						
7. Evaluate extraordinary power use by programmatic experimental activities		X						
8. Apply to DOE - FEMP for appropriate programmatic power use exemptions			X					
9. Recommend energy efficiency & water conservation measures in design reviews	---------- X ----------				---------- X ----------			
10. Apply for funding of audit id'd life-cycle cost-effective water conservation measures					X	X		
11. Complete FY 2003 - FY 2004 Energy Efficiency & Water Conservation Audits				X				
12. Conduct additional Energy Efficiency & Water Conservation Audits as funds avail					X	X	X	X
13. Develop & submit funding requests for backlog audit id'd ECOs			X	X				
14. Inform new building project teams of DOE O 430.2A requirement for an EE/SD-Rs	---------- X ----------				---------- X ----------			
15. Design Reviews: assure Energy Star® &/or Ca T-24 effiency standards specified	---------- X ----------				---------- X ----------			
16. Seek management approval to allow submittal of Super-ESPC initial proposals.		X						
17. Seek approval to implement proposed cost effective Super-ESPC project(s).						X		
18. Seek funds to expand electric metering software, adding per-building reports					X			

LLNL FY 2004 Energy Management Plan
Greenhouse Gas Emissions FY 1990 through FY 2003

Fiscal Year	% Reduction Goal	CO2 Reduction Goal	CO2 Emissions	% CO2 Reduction	Area (1,000 SF)	CO2 / KSF	% CO2/KSF Reduction
1990	0.0%	315,445.920	315,445.920	0.0%	5,902.700	53,440.954	0.0%
1991	-1.500%	310,714.231	326,937.698	3.6%	5,987.900	54,599.726	-2.2%
1992	-3.000%	305,982.542	366,497.282	16.2%	5,961.300	61,479.423	-15.0%
1993	-4.500%	301,250.854	310,457.731	-1.6%	5,990.900	51,821.551	3.0%
1994	-6.000%	296,519.165	294,565.957	-6.6%	6,107.700	48,228.622	9.8%
1995	-7.500%	291,787.476	298,163.224	-5.5%	6,238.600	47,793.291	10.6%
1996	-9.000%	287,055.787	286,198.032	-9.3%	6,234.700	45,904.058	14.1%
1997	-10.500%	282,324.098	293,252.998	-7.0%	6,263.500	46,819.350	12.4%
1998	-12.000%	277,592.410	295,375.876	-6.4%	6,254.800	47,223.872	11.6%
1999	-13.500%	272,860.721	272,635.162	-13.6%	5,880.135	46,365.460	13.2%
2000	-15.000%	268,129.032	137,862.149	-56.3%	6,219.985	22,164.386	58.5%
2001	-16.500%	263,397.343	230,481.732	-26.9%	6,209.586	37,117.085	30.5%
2002	-18.000%	258,665.654	236,253.844	-25.1%	7,002.362	33,739.165	36.9%
2003	-19.500%	253,933.966	250,561.877	-20.6%	7,040.880	35,586.727	33.4%
2004	-21.000%	249,202.277					
2005	-22.500%	244,470.588					
2006	-24.000%	239,738.899					
2007	-25.500%	235,007.210					
2008	-27.000%	230,275.522					
2009	-28.500%	225,543.833					
2010	-30.000%	220,812.144					

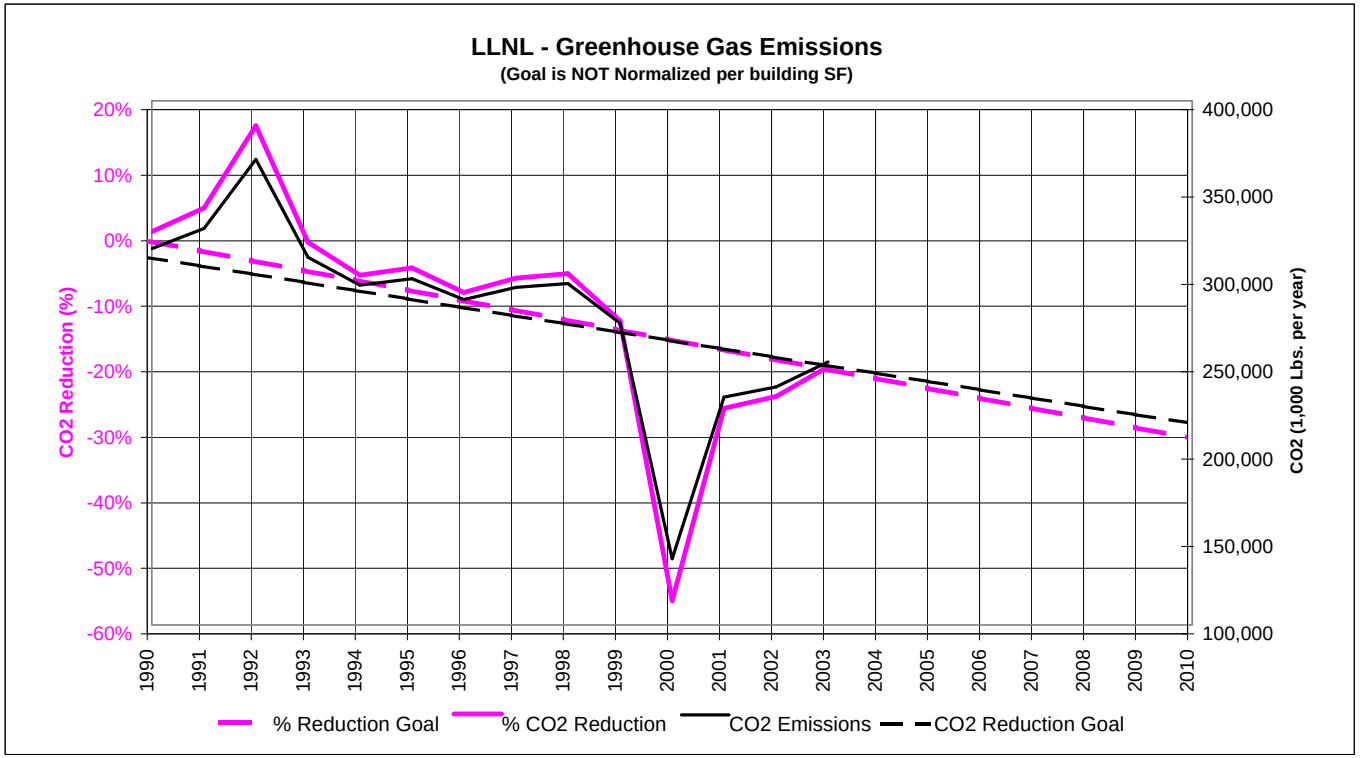
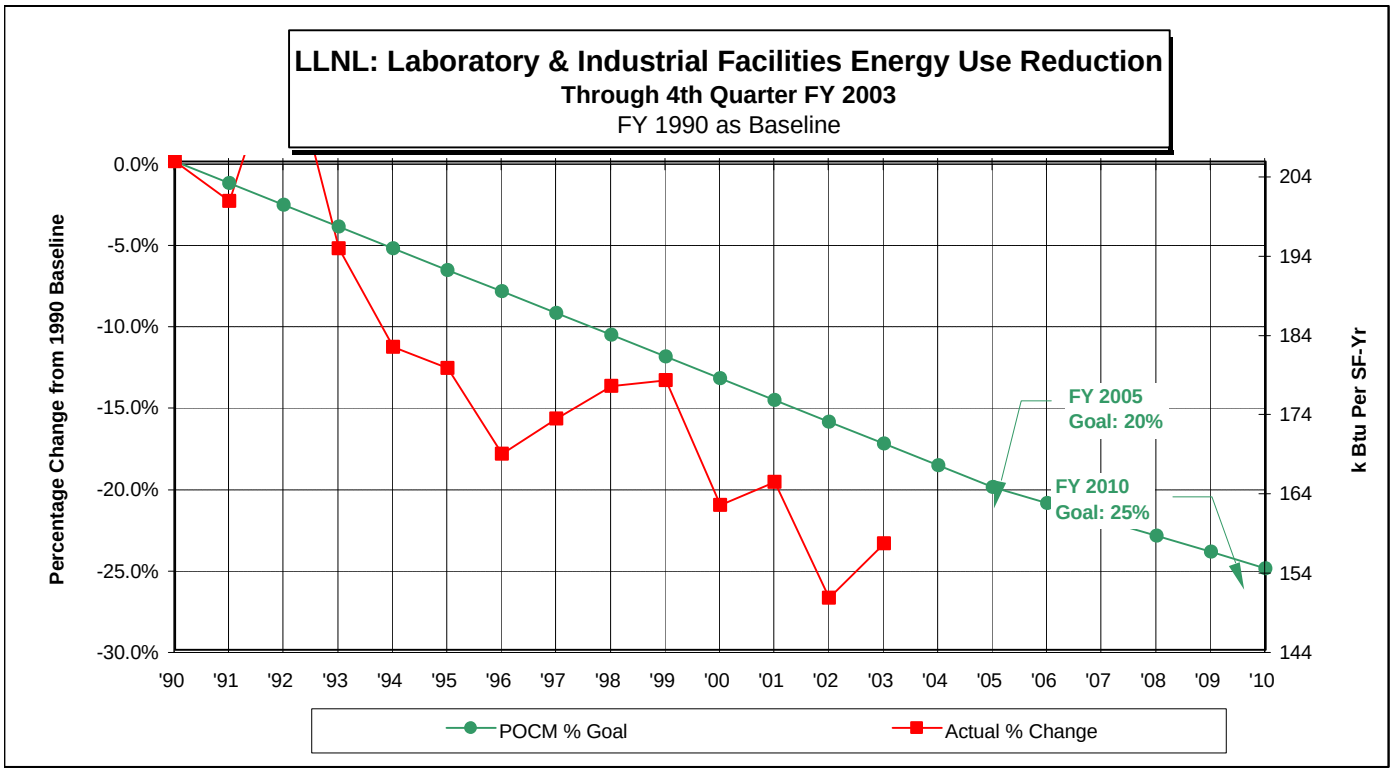


Exhibit D

FY 2004 LLNL Energy Management Plan

Energy Use and Cost Performance through 4th Quarter FY 2003



FY 1999 & FY 2000: Reports do not include USEC/AVLIS buildings and 40% of Central Plant power use.
FY 2001 & FY 2002: USEC/AVLIS buildings returned to LLNL & all central plant energy use is included. SF, energy use and costs are not included for NIF facilities without beneficial occupancy.
FY2003: NIF is now operating and is using energy more intensely - will consider requesting exclusions for some process energy use.

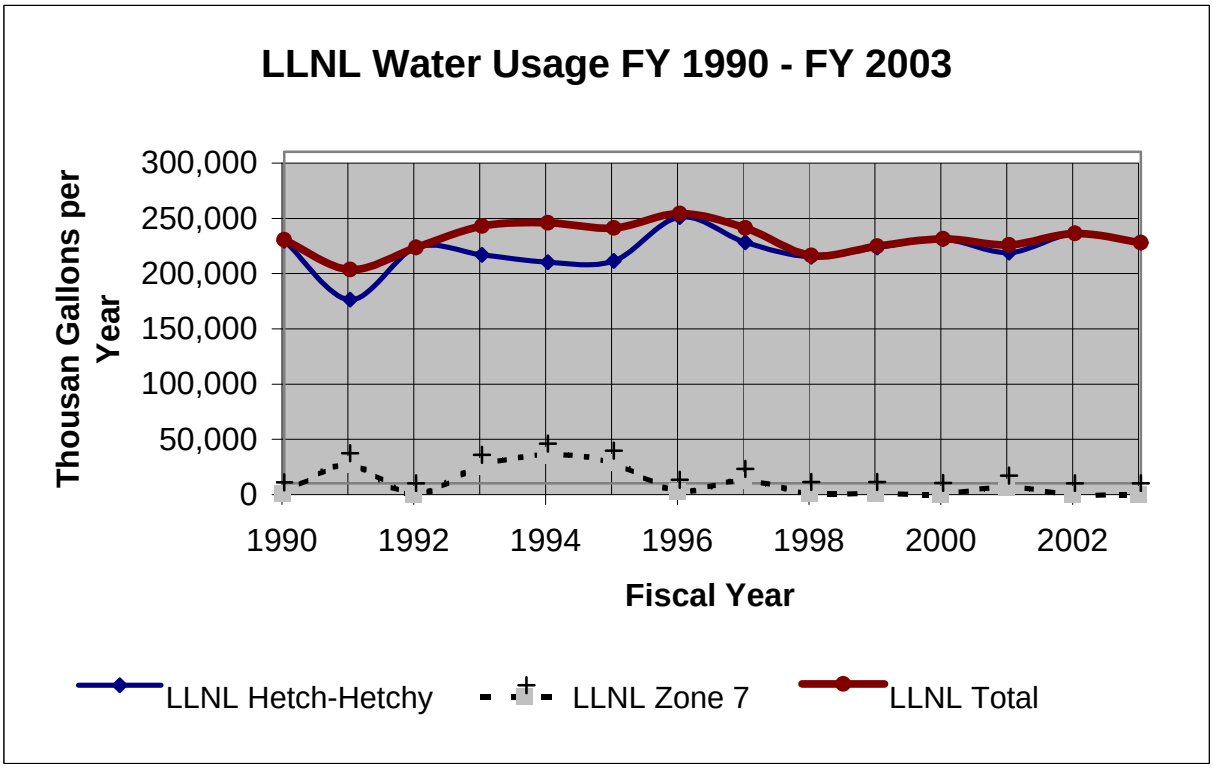
Annual Laboratory and Industrial Facility Energy Consumption in Thousand BTUs / Square Foot (k BTU/SF - Yr)

FY	Actual (k BTU/SF)	Plan (k BTU/SF)	POCM % Goal	Actual % Change
'90	289.613	289.613	0.00%	0.00%
'91	282.577	285.752	-1.33%	-2.43%
'92	312.278	281.890	-2.67%	7.83%
'93	274.150	278.029	-4.00%	-5.34%
'94	256.635	274.167	-5.33%	-11.39%
'95	252.864	270.306	-6.67%	-12.69%
'96	237.593	266.444	-8.00%	-17.96%
'97	243.823	262.583	-9.33%	-15.81%
'98	249.692	258.721	-10.67%	-13.78%
'99	250.712	254.860	-12.00%	-13.43%
'00	228.504	250.998	-13.33%	-21.10%
'01	232.601	247.137	-14.67%	-19.69%
'02	211.933	243.275	-16.00%	-26.82%
'03	221.649	239.414	-17.33%	-23.47%
'04		235.552	-18.67%	
'05		231.691	-20.00%	
'06		228.794	-21.00%	
'07		225.898	-22.00%	
'08		223.002	-23.00%	
'09		220.106	-24.00%	
'10		217.210	-25.00%	

FY 2004 LLNL Energy Management Plan

Annual Water Use & Cost FY 1990 through FY 2003

	Hetch-Hetchy		Zone 7		LLNL Total	
Fiscal Year	LLNL k Gallons	LLNL Cost	LLNL k Gallons	LLNL Cost	LLNL k Gallons	LLNL Cost
1990	219,467.7	$213,287	945.0	$2,600	220,412.7	$215,886
1991	166,130.7	$168,131	27,273.0	$59,172	193,403.7	$227,303
1992	213,472.0	$253,052	0.0	$864	213,472.0	$253,916
1993	206,884.2	$244,727	25,813.0	$71,947	232,697.2	$316,674
1994	200,029.0	$278,890	35,824.0	$108,412	235,853.0	$387,302
1995	201,322.1	$310,680	29,656.0	$99,341	230,978.1	$410,021
1996	240,905.7	$387,339	3,291.0	$12,858	244,196.7	$400,197
1997	218,062.3	$353,346	13,039.2	$50,638	231,101.5	$403,984
1998	205,022.0	$332,600	1,188.0	$5,794	206,210.0	$338,393
1999	213,462.4	$346,028	1,020.0	$5,092	214,482.4	$351,120
2000	220,988.5	$356,394	291.2	$2,282	221,279.7	$358,676
2001	208,762.0	$370,307	6,845.6	$30,155	215,607.6	$400,463
2002	226,180.2	$527,173	0.0	$1,099	226,180.2	$528,272
2003	217,865.5	$560,702	0.0	$1,121	217,865.5	$561,823



FY	Floor Area	Use/SF	% Reduction	Population	Use/PN	% Reduction
FY 1990	5902.7	37.3409965	Baseline	11346	19.42646748	Baseline
FY 2001	6209.586	34.7217371	7.0%	9727	22.16589008	-14.1%
FY 2002	7002.362	32.3005637	13.5%	10171	22.23775833	-14.5%
FY 2003	7040.88	30.9429321	17.1%	10326	21.09872865	-8.6%

FY 2004 LLNL Energy Management Plan
Energy Efficiency and Water Conservation Audits

Remaining Energy / Water Audits to be Scheduled and Preformed			
Level 1: Audits to be Done	(See audit descriptions, below)	1,158,018 SF	16.3% of Baseline
Level 2: Audits to be Done	(See audit descriptions, below)	349,851 SF	4.9% of Baseline
Level 3: Audits to be Done	(See audit descriptions, below)	806,797 SF	11.4% of Baseline
Building Remaining to be Audited		**2,314,666 SF**	**32.6% of Baseline**
Comprehensive Audits Performed during 1990s		2,275,831 SF	32.1% of Baseline
Audited by LLNL - EMP FY 2002 - FY 2003		979,379 SF	13.8% of Baseline
Subtotal, Completed Audits		3,255,210 SF	45.9% of Baseline
Buildings to be Audited FY 2003 - FY 2004		890,150 SF	
Additional Buildings to be Audited FY 2003 - FY 2004		27,262 SF	
Total Buildings to be Audited FY 2003 - FY 2004		917,412 SF	12.9% of Baseline
Buildings Removed from Future Audit Planning Baseline			
DEMOs: Removed from FY 2003 - FY 2004 Audit Scope		64,387 SF	
DEMOs: Planned by FY 2006 - No Audits		348,858 SF	
Tents - N/A for Building Audits		99,562 SF	
"Bunkers/Vaults" N/A for Building Audits		13,284 SF	
Lo/No Energy Using Buildings - Do Not Audit		2,739 SF	
Leased Facilities - No Audits		78,224 SF	
Total Buildings Removed from Future Audit Planning		607,054 SF	8.6% of Baseline
Total Baseline LLNL Buildings for Energy & Water Audits		**7,094,342 SF**	**100.0% of Baseline**
Audits Performed & Planned: period FY 2002 to FY 2004		**2,503,845 SF**	**35.3% of Baseline (3 FY's)**
(including Buildings Removed)			11.8% of Baseline per Year

Audit Level Descriptions for Energy / Water Audits to be Scheduled and Preformed

Level 1: **Complex**: Facilities that will require the most time per SF to audit. These facilities have complex HVAC systems with automatic controls.

Level 2: **Medium**: Facilities with HVAC systems of moderate complexity. These buildings will not be trailer / modular office buildings of laboratory / industrial buildings. They are permanent office buildings.

Level 3: **Simple**: Least complex facilities, requiring very little effort to audit. These facilities include trailer / modular office buildings, storage and similar facilities, in addition to mothballed facilities.

Exhibit G

FY 2004 LLNL Energy Management Plan
Project Backlog List

Rate Date: 01-May-03 | Electric Use = 0.03531 | Electric Demand = 2.50 | Natural Gas = 0.60

Building Number	ECO #	Escalation: 1.05 multiplier mid 1996 to 2000 & 3% for 2001 through 2 Recommended ECO	Average 1996 $ Project TEC	Escalated to Mid 2004 $ Project TEC	Electric (kWh) Savings	Electric Demand (kW) Savings	Natural Gas (therms) Savings	TEC Savings	Payback Years	Comments
Building HVAC Control System Retrofits and Upgrades										
Multiple	219, 239,365,871	Upgrade HVAC System Controls	$90,216	$106,616	247,565	26	31,665	$28,521	3.7	
321	321-1	Upgrade Selected HVAC Systems Control to DDC	$98,100	$115,933	653,100	-4.2	16,600	$32,895	3.5	***HVAC/Cntrl Retrofit- underway***
321	321-3	Reset Chilled Water Supply (Do ECO-1 and ECO-2 first)	$500	$591	15,373	11.4	0	$885	0.7	***HVAC/Cntrl Retrofit- underway***
327	327-2	Upgrade HVAC Controls	$53,335	$63,030	291,007	2.4	0	$10,347	6.1	
361	361-1A	Upgrade Controls to EMS	$254,000	$300,173	472,000	0	85,100	$67,726	4.4	
361	361-1B	Upgrade Controls to EMS and Install VFDs	$347,000	$410,079	834,000	0	79,200	$76,969	5.3	
391	391-1	DDC Upgrade for Selected HVAC Systems	$156,700	$185,186	2,420,000	459	0	$99,220	1.9	***B391 E HVAC Backlog Redux underway***
Site 300	Various Blldgs	Retrofit DDC Controls on HVAC Systems	$183,707	$275,000	1,569,897	0	0	$55,433	5.0	***DOE-FEMP & LLNL-EMP funded project Underway***
4675	4675-1	Upgrade HVAC Controls	$11,600	$13,709	194,800	-1.5	0	$6,833	2.0	
543	543-2	Upgrade HVAC Controls to DDC	$149,233	$176,361	733,313	4.2	0	$26,019	6.8	
Subtotal: Building HVAC Control System Retrofits and Upgrades			$1,344,391	$1,646,678	7,431,055	497.3	212,565	$404,849	4.1	
Chiller Replacements, Upgrades and System Modifications										
131	131-3	Expand Main Chilled Water Piping System to Replace RCH-6,7, & 8	$142,372	$168,253	79,740	51	0	$4,346	38.7	
241	241-3	Replace Two Reciprocating Chillers with S.Chillers	$338,800	$400,389	23,500	33	0	$1,820	220.0	
281	281-1	Upgrade Chillers	$209,600	$247,702	163,000	13.0	0	$6,146	40.3	
Subtotal: Chiller Replacements, Upgrades and System Modifications			$690,772	$816,343	266,240	97.0	0	$12,311	66.3	
System & Equipment Efficiency Improvements										
117	117-2	Modify Three ACUs for Computer Lab Econ. Control	$10,690	$12,633	97,100	-3.9	0	$3,312	3.8	
153	153-3	Clean Room Recirculation Flow Reduction	$8,000	$9,454	259,942	59.1	0	$10,952	0.9	Do either Option A or B, not both.
153	153-5	ACU-3 Heat Recovery System	$61,140	$72,254	(18,164)	(2.2)	16,696	$9,310	7.8	
481	481-3	Install Thermostat to Control FE-3	$510	$603	1,870	0	0	$66	9.1	
551	551-2	Upgrade VAV Operation, Perimeter Reheat System & Con.	$365,423	$431,851	1,078,189	76	14,625	$49,126	8.8	
Site 300	S300-2	Reduce Cooling Tower Pumping During Non-Test Hours (801,34,36,5	$72,141	$85,255	253,529	0	0	$8,952	9.5	
Subtotal: System & Equipment Efficiency Improvements			$517,904	$612,051	1,672,466	129	31,321	$81,717	7.5	
Variable Frequency Drive Retrofits and Upgrades										
113	113-3	Install VFDs and Upgrade HVAC Controls to DDC	$193,111	$228,216	897,964	44.9	20,061	$45,091	5.1	
131	131-2	Mod. Main Chilled H20 Piping System to Provide Var.Flow 2ndary Pur	$57,046	$67,416	42,717	5	0	$1,658	40.7	
321	321-2	Install VFD Control on Lead Secondary Chilled Water Pump (Do ECO	$9,231	$10,909	91,437	0	0	$3,229	3.4	***HVAC/Cntrl Retrofit- underway***
481	481-2	Install VFDs for ACU-1, -2	$28,600	$33,799	76,800	-1	-204	$2,559	13.2	
Subtotal: Variable Frequency Drive Retrofits and Upgrades			$287,988	$340,340	1,108,918	48.9	19,857	$52,537	6.5	
Lighting System and Control Upgrades										
166	166-1	Upgrade Lighting Systems/Controls	$13,520	$15,978	23,800	3.6	0	$948	16.8	
241	241-2	Implement Lighting System Upgrade	$117,500	$138,860	172,690	27	0	$6,908	20.1	
543	543-1	Install Occupancy Sensors	$9,359	$11,060	23,736	0	0	$838	13.2	
Subtotal: Lighting System and Control Upgrades			$140,379	$165,898	220,226	30.6	0	$8,694	19.1	
Premium Efficiency Motor Upgrades										
113	113-4	Install Premium Efficiency Motors	$44,520	$52,613	102,542	11.7	0	$3,972	13.2	
Multiple	219, 239,365,871	Install Premium-Efficiency Motors	$13,882	$16,406	31,142	4	0	$1,220	13.5	
327	327-4	Install Premium-Efficiency Motors	$2,714	$3,207	6,289	0.7	0	$243	13.2	
543	543-3	Install Premium Efficiency Motors	$10,392	$12,281	28,662	3.3	0	$1,111	11.1	
543	543-3	Install Premium Efficiency Motors	$10,392	$12,281	28,662	3.3	0	$1,111	11.1	
551	551-3	Install Premium Efficiency Motors	$23,799	$28,125	59,794	6.9	0	$2,318	12.1	
Subtotal: Premium Efficiency Motor Upgrades			$105,699	$124,913	257,091	29.9	0	$9,975	12.5	
Total: Audit Identified ECO's			$3,087,133	$3,706,223	10,955,996	832.7	263,743	$570,083	6.5	
Totals for all projects with less than 4.0-Year Payback Periods & Not Underway			**$120,506**	**$142,412**	**$799,407**	**79.7**	**31,665**	**$49,617**	**2.9**	**Not including O&M Savings**